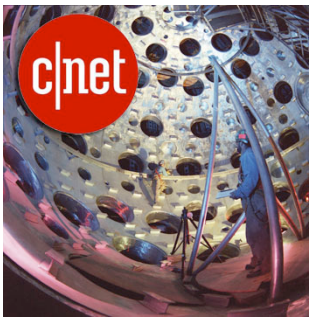
LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory, June 1-June 7, 2010

Star power equals clean energy



Inside the NIF target chamber.

Question: What does creating a star in a Laboratory have in common with carbon-free energy?

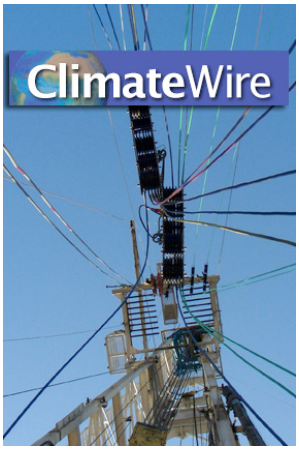
Answer: The National Ignition Facility.

NIF is the world's largest and highest-energy laser and has the goal of achieving nuclear fusion and energy gain in the laboratory for the first time. In other words, it will get more energy out than goes in to produce it.

NIF is a proof-of-concept system to create fusion. The hope is that this concept will be online as a power plant within 15 to 20 years. Fusion experiments are scheduled for later this year.

To read more, go to http://news.cnet.com/geek-gestalt/?tag=mncol

Watch out for that plume



A web of cables hangs over a drill-rig during the Electric Resistance Tomography (ERT) electrode array installation process.

An LLNL technique originally applied to monitor the flow of contaminants into shallow groundwater supplies has been repurposed to monitor carbon dioxide pumped deep underground for storage.

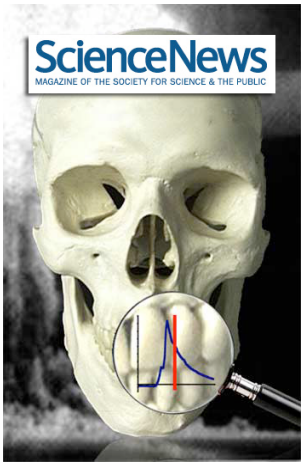
Electric Resistance Tomography (ERT) has been installed to track where a plume of injected CO_2 moves underground in an oil field near Natchez, Miss.

The ERT project is the deepest (10,000 feet) subsurface application of the method to date. ERT uses vertical electrode arrays, usually in a cross-well arrangement, to perform four-electrode measurements of changes in the spatial distribution of electrical resistance within a subsurface formation.

ERT, a technology developed for environmental and geologic applications at Livermore starting in the 1980s, is similar to a computed tomography scan. It images soil resistivity, and that gives scientists information on soil properties such as temperature, soil type and saturation. It also can provide scientists with critical information on what happens to the CO_2 once it's stored deep underground.

To read more, go to https://publicaffairs.llnl.gov/news/lab_report/2010/eenews.net.pdf

Teething on forensics



By using the bomb curve data from above-ground nuclear weapons testing during the Cold War, Lab scientists can determine a victim's birth date by examining dental enamel.

Many coroners have used dental records to help identify a Jane or John Doe. But a Livermore scientist can one-up that technique.

LLNL's Bruce Buchholz, working in conjunction with colleagues at the Karolinska Institute in Stockholm, have found a technique to date unidentified human remains more precisely than other forensic methods.

Above-ground testing of nuclear bombs in the 1950s and early 1960s created elevated levels of radioactive carbon that soon became incorporated into all living things. Those elevated levels of radiocarbon were tracked carefully, and they began to drop off quickly after a test ban treaty was signed in 1963.

That carbon remains in the victim's dental enamel, the hardest substance in the body, and the analysis showed that dating the teeth with the carbon-14 method would estimate the birth date within one year, thus giving coroner's a stronger clue to identify victims of crimes or natural disasters.

To read more, go to
http://www.sciencenews.org/view/generic/id/59451/title/Science_%2B_the_Public__Teeth_as_a_forensic_clock

Bugs be gone

Purdue University researchers, working with high-performance computing experts at Lawrence Livermore, have created an automated program to "debug" simulations used to more efficiently certify the nation's nuclear weapons.

The program, called AutomaDeD (pronounced like automated), finds errors in computer code for complex "parallel" programs.

Because international treaties forbid the detonation of nuclear test weapons, certification is done using complex simulations. The simulations, which may contain as many as 100,000 lines of computer code, must accurately show reactions taking place on the scale of milliseconds, or thousandths of a second.

"Many times, an error in a simulation code may not become evident until long after it occurs," said Bronis de Supinski, co-leader of the ASC Application Development Environment Performance Team at the Laboratory. "These delays are challenging since they make the actual location of the bug unclear."

To read more, go to http://www.sciencedaily.com/releases/2010/06/100601171725.htm

Scientist on board to lead S&T

Tomás Díaz de la Rubia

Lab scientist Tomás Díaz de la Rubia has been selected as the deputy director for Science & Technology to steward the continued long-term health of science, technology and engineering at the Laboratory.

Díaz de la Rubia has served as an associate director for Chemistry, Materials, & Life Sciences. Since June 2009, he has been the acting S&T principal associate director and Laboratory chief R&D officer. The new position is effective immediately.

Díaz de la Rubia joined the Laboratory as a postdoc in 1989 and since 2002 has held a variety of senior management positions. He has published more than 150 peer-reviewed articles focused on the application of high-performance computing to materials properties in extreme environments, and co-edited several books. His work has been cited more than 5,800 times.

To read more, go to http://www.bizjournals.com/sanfrancisco/stories/2010/05/31/daily53.html

Breaking down biofuels

While the use of biofuels is on the rise, few researchers know what happens when each type -- from liquid ethanol to solid biomass -- breaks down while burning.

But Sandia researcher Nils Hansen and Lawrence Livermore scientist Charles Westbrook are trying to determine how toxins released during combustion compare to those coming from burning fossil fuel.

A series of recent studies examines what exactly is coming out of a biofuel tailpipe. They found that while biofuel combustion produces many of the same chemicals released during the burning of fossil fuel, it also generates a complicated mixture of additional chemicals that are potentially harmful to humans and the environment.

To read more, go to
http://www.climatecentral.org/breaking/blog/study_raises_new_questions_about_biofuels

Latest *Newsline* available

NEWSLINE

Newsline provides the latest Lab research and operations news. See the most recent issue at https://newsline.llnl.gov

---

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The *Livermore Lab Report* archive is available at:
https://publicaffairs.llnl.gov/news/lab_report/2010index.html